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Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, July 2019

(2013 Scheme)

13.705 : DESIGN OF MACHINE ELEMENTS — II (M)

Time : 3 Hours Max. Marks : 100

Use of approved design data book permitted.

PART – A

Answer **all** questions : Each question carries 4 marks.

1. Why direct compressive stress is ignored while finding out the strength of the gear tooth?

2. Discuss the static load carrying capacity of the rolling element bearing.

3. Why a positive clutch is used?

4. (a) Why I section is chosen for the connecting rod of an I.C. engine.

   (b) What types of stresses are induced in a crankshaft?

5. What are the advantages of centrifugal clutch?

P.T.O.

PART – B

Answer **any one full** questions from **each** Module. Each question carries 20 marks.

Module – I

6. A micarta pinion rotating at 1200 rpm is to transmit 1 kW to a cast iron gear at a speed of 192 rpm assuming a starting overload of 20% and using 20 full depth involute teeth. Determine the module, number of teeth on the pinion and gear and face width. Take allowable static strength for micarta as 40 MPa and for cast iron as 53 MPa. Check the pair in wear.

OR

7. Design a pair of helical gears to transmit 30 kW power at a speed reduction ratio of 4 : 1. The input shaft rotates at 2000 rpm. Take helix and pressure angles equal to 25° and 20° respectively. The number of teeth on the pinion may be taken as 30.

Module – II

8. A journal bearing is to be designed for a centrifugal pump for the following data:

   Load on the journal = 12 kN; Diameter of the journal = 75 mm; Speed = 1440 r.p.m.; Atmospheric temperature of the oil = 16°C; Operating temperature of the oil = 60°C; Absolute viscosity of oil at 60°C = 0.023 kg/m-s.

   Give a systematic design of the bearing.

OR

9. Select a suitable ball bearing to carry a radial load of 10000 N and an axial load of 4000 N. The shaft rotates at 1000 rpm. Average life is 6000 hrs. Inner race rotates. Take mild shock.

Module – III

10. A connecting rod is to be designed for a high speed I.C. Engine. The data available are:

Diameter of piston = 90 mm, mass of reciprocating parts = 1.5 kg, length of connecting rod-centre to centre = 350 mm, stroke = 140 mm, rpm = 2200, (when developing 55 kW, possible over speed = 3000 rpm, compression ratio 6.8 : 1 approximately), probable maximum explosion pressure (assumed shortly after dead centre say 3°) = 3N/mm^2. Draw a fully dimensioned drawing of the connecting rod showing the provision for lubrication.

OR

11. Design a CI piston for a single acting IC engine having 200 mm as the cylinder bore. The maximum explosion pressure may be taken as 4 N/mm^2. The piston is to have 5 compression rings and one oil ring. The permissible tensile stress for CI may be taken as 38.5 N/mm^2. The permissible stress for the piston ring is 100 N/mm^2 and the radial wall pressure is 0.04 N/mm^2.

Module – IV

12. An external pressure of 10 MN/m^2 is applied to a thick cylinder having internal diameter as 150 mm and external diameter as 300 mm. if maximum hoop stress permitted on the inside of the wall is 35 MN/m^2, calculate the change in the outside diameter. Take E = 210 GN/m^2 and coefficient of friction = 0.3.

OR

13. A multiple disc clutch is composed of 5 steel and 4 bronze disks. The clutch is required to transmit 16 Nm torque. If the inner diameter is restricted to 50 mm, determine the necessary outer diameter of the disk and axial force. The coefficient of friction may be taken as 0.1 and the average pressure is not to exceed 350 N/mm^2.